CLAIMS

We claim:

1. A device (1) for measuring the three-dimensional movements of an eye, said device comprising:

a means for marking an array of positions on said eye whose movements are to be measured,

a means for capturing the two-dimensional, digital images of said array of eye-marked positions as said eye is moved, said image capturing means having an optical axis and a prescribed spectral range,

a means for illuminating said marker array with a light source whose output is in a spectral range that is chosen from the group consisting of those that are either within or outside of said spectral range of said image capturing means,

a means for aligning said optical axis of said image capturing means with the center of said eye, and

a means for computing the three-dimensional locations of said array of eye-marked positions from the information contained in said captured digital images.

2. The device (1) as recited in Claim 1, further comprising a means for fixing the position of said image capturing means relative to the position of said eye whose movements are to be measured.

3. The device (1) as recited in Claim 1, wherein said alignment means including an alignment light source (20).

4. The device (1) as recited in Claim 2, wherein said alignment means including an alignment light source (20).

5. The device (1) as recited in Claim 1, wherein said array marking means including a fluorescent pigment.

6. The device (1) as recited in Claim 5, wherein said array illuminating means including an ultra-violet light source.

7. The device (1) as recited in Claim 2, wherein said array marking means including a fluorescent pigment.

8. The device (1) as recited in Claim 7, wherein said array illuminating means including an ultra-violet light source.

9. The device (1) as recited in Claim 3, wherein said array marking means including a fluorescent pigment.

10. The device (1) as recited in Claim 9, wherein said array illuminating means including an ultra-violet light source.

11. The device (1) as recited in Claim 1, wherein said array marking means including an anti-Stokes fluorescent pigment.

12. The device (1) as recited in Claim 11, wherein said array illuminating means including an infrared light source.

13. The device (1) as recited in Claim 2, wherein said array marking means including an anti-Stokes fluorescent pigment.

14. The device (1) as recited in Claim 13, wherein said array illuminating means including an infrared light source.

15. The device (1) as recited in Claim 3, wherein said array marking means including an anti-Stokes fluorescent pigment.

16. The device (1) as recited in Claim 15, wherein said array illuminating means including an infrared light source.

17. The device (1) as recited in Claim 1, wherein said means of marking an array of positions on said eye whose movements are to be measured having three markers (6) arranged in a 45 degree right triangle.

18. The device as recited in Claim 17, wherein said means of computing the locations of said markers having an algorithm having a rotation matrix that describes the eye rotation required to move said markers (6) from a first position to a second position.

19. The device as recited in Claim 1, wherein said image capturing means having a digital camera (2), a computer processor (32) and a high-speed interfacing device that connects said camera (2) and said processor (32).

20. The device as recited in Claim 19, wherein said processor (32) being configured to fit within a computer chosen from the group herein described as a desktop, laptop, notebook or sub-miniature notebook.

21. A method for measuring the three-dimensional movements of an eye, said method comprising the steps of:

marking an array of positions on said eye whose movements are to be measured,

illuminating said marker array with a light source (12) whose output is in a prescribed first spectral range,

aligning the optical axis of a digital camera (2) with the center of said eye,

using said camera (2) to capture the two-dimensional, digital images of said array of eye-marked positions as said eye is moved, wherein said images are captured in a spectral range that is chosen from the group consisting of those that are either within or outside of said spectral range of said camera (2), and

computing the three-dimensional positions of said array of eye-marked positions from the information contained in said captured digital images.

22. The method as recited in Claim 21, further comprising the step of fixing the position of said camera optical axis relative to the position of said eye whose movements are to be measured.

23. The method as recited in Claim 21, wherein said alignment step involves using an alignment light source (20).

24. The method as recited in Claim 22, wherein said alignment step involves using an alignment light source (20).

25. The method as recited in Claim 21, wherein said array marking step involves using a fluorescent pigment.

26. The method as recited in Claim 25, wherein said illuminating step involves using an ultra-violet light source.

27. The method as recited in Claim 22, wherein said array marking step involves using a fluorescent pigment.

28. The method as recited in Claim 27, wherein said illuminating step involves using an ultra-violet light source.

29. The method as recited in Claim 23, wherein said array marking step involves using a fluorescent pigment.

30. The method as recited in Claim 29, wherein said illuminating step involves using an ultra-violet light source.

31. The method as recited in Claim 21, wherein said array marking step involves using an anti-Stokes fluorescent pigment.

32. The method as recited in Claim 31, wherein said illuminating step involves using an infrared light source.

33. The method as recited in Claim 22, wherein said array marking step involves using an anti-Stokes fluorescent pigment.

34. The method as recited in Claim 33, wherein said illuminating step involves using an infrared light source.

35. The method as recited in Claim 23, wherein said array marking step involves using an anti-Stokes fluorescent pigment.

36. The method as recited in Claim 35, wherein said illuminating step involves using an infrared light source.

37. The method as recited in Claim 21, wherein said marking step involves using three markers (6) arranged in a 45 degree right triangle.

38. The method as recited in Claim 37, wherein said computing step involves using an algorithm having a rotation matrix that describes the eye rotation required to move said markers (6) from a first position to a second position.

39. The method as recited in Claim 21, wherein said image capturing step involves using a computer processor (32) and a high-speed interfacing device (36) that connects said camera (2) and said processor (32).

40. The method as recited in Claim 39, wherein said image capturing step involves using said computer processor (32) which is configured to fit within a computer chosen from the group herein described as a desktop, laptop, notebook or sub-miniature notebook.